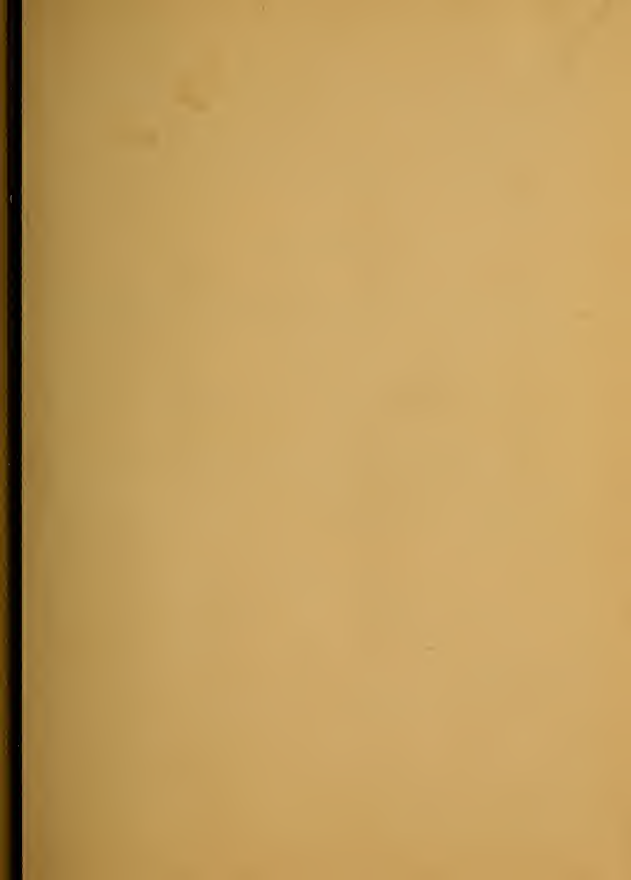


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CHOLERA;

ITS

History, Cause and Prevention.



ERRATA.

On page 37, near the end of the 10th line from the top, after the word "that" insert the words "in a cholera season."

On page 69, at the end of the 15th line from the top, after the word "any" insert the word "is."

On page 96, in the 9th line from the top, the quotation marks after the word "air" should have been placed before the word "The" in the same line.

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CHOLERA;

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BY

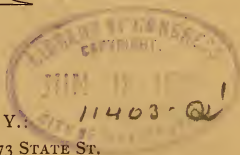
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PREFACE.

The actual existence of cholera, at the present time, in France and Spain, as indicated by its reappearance in Marseilles, Valencia, and other places, renders its appearance in this country very probable, and to know how to prevent it from spreading over our land becomes a matter of the utmost importance. A review of its history and causes, we believe, will contribute much toward this end; hence this little book. It is not designed to be an exhaustive treatise on the subject of cholera, neither is it a scientific monograph designed solely for the use of the medical profession. It is written for the people, and an effort has been made to place before them, in an unpretentious manner, the latest and best opinions. It is made of small size that it may serve as a

companion to very many persons; and if by its study any considerable portion of the people are aroused to the importance of individual effort and coöperation with their Boards of Health in sanitary matters, its object will have been attained. While we are writing, reports come from across the water of the gratifying results of inoculation for the prevention of cholera. In time this may, perhaps, prove of as great value as vaccination, but for the present our reliance must be upon sanitation.

The author desires to acknowledge his indebtedness to other writers from whom he has freely quoted, but to whom he has endeavored to give due credit, and to say in this connection that the whole of the fifth chapter was very kindly contributed by Dr. Willis G. Tucker, Professor of Inorganic and Analytical Chemistry in the Albany Medical College.

To Drs. Albert Van der Veer, Samuel B. Ward and Frederic C. Curtis, of this city, whose numerous courtesies have rendered the completion of the book possible in the short time allotted to the work, he tenders his sincere thanks.

E. A. B.

9 SOUTH HAWK ST., ALBANY, N. Y.

June, 1885.



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CHAPTER I.

CHOLERA—ITS HISTORY.

Cholera is a disease which is looked upon by different persons with varying emotions; to those who have read of the terrible ravages produced by it in certain localities, or have seen the streets deserted, business suspended, and death regnant in a city, have heard the rattle of the death-cart as it bore to the hastily made grave, victim after victim of the fearful scourge, it produces feelings akin to terror. To those engrossed in business, with no thought but for the accumulation of wealth or position, it brings but a momentary anxiety, which is at once lost in the busy whirl, just as are the cry of the injured, the wail of the oppressed, and the moan of the smitten. But to those of the community who comprise

the considerate and earnest class; who regard the welfare of others as somehow very closely related to their own; who are accustomed to look upon life as a grand opportunity for the growth and development of the principles of good; and upon the various tribulations which come to individuals and peoples as in some way subserving this end, and, for this reason, to be manfully accepted, studied and made to divulge their secret, to such persons it brings much anxiety, is the cause of much serious reflection, but at the same time inspires to earnest work. Too much admiration cannot be felt for the army of patient investigators who, regardless of their own comfort, zealously labor to bring to light the hidden causes of evil, that they may be removed. It is interesting to study the reflections and review the work of such persons, and contemplate the advantages which accrue to society and the world by reason of them. In the history of cholera epidemics these facts are emphasized, for, as Dr. Simmons in his elaborate report of

the epidemics in Japan, quoting Macpherson, says, "It is one of the oldest diseases whereof a distinct description exists and there are few disorders respecting which such an uninterrupted chain of evidence has been preserved;"* and we might go further and state that in this complete record we find the strongest evidence of the value of careful study into the nature and causes of those evils which produce widespread devastation and of the prompt application of such measures as reduce the evil to a minimum. Centuries ago it was looked upon as a visitation of the wrath of the gods and a means by which vengeance was wreaked upon unhappy mortals. When an epidemic was raging furiously the most abject terror seized upon the people and, they becoming panic stricken, nothing was done and they died by thousands.

Later, in Japan, the disease was generally attributed to diabolical agency; "Hence the people gave it the name of *ko-ro-ri*; that is,

* Cholera Epidemics in Japan, by D. B. Simmons, M. D.

‘fox, wolf, and badger.’ It was also believed that all water and all fish were poison, so that people dared not draw water even from the pure stream of the upper Tamagawa, nor eat any fresh fish, even when it was brought to their doors alive. Each one adorned his gate with branches of pine and bamboo, and straw ropes, and prayed that so dreadful a year might pass away as quickly as possible; some praying to *kamé* and some to Buddha.”* Little was known of it then except its fearful mortality; now the circumstances under which it thrives are most completely understood, and sanitary measures are undertaken which, in many instances, are sufficient to stamp it out at once.

The disease is indigenous to Asia and, although attempts have been made to prove that the first cases in the epidemic which prevailed in some portions of France last year, originated *de novo* in that country, it is pretty generally regarded as an Asiatic disease, and appears in

* Op. cit.

other countries in accordance with the sequence of given circumstances. Away back in the 15th century it is reported to have existed, and descriptions by some of the medical solons of that period bring to our mind very clearly the so-called typical symptoms of Asiatic cholera, as we know them to-day.

Cormack, in his "Studies," mentions the fact, as having been reported by Dr. John Webster, that in the days of Sydenham and Morton (1669-93) the population of London being at the time (1669) but 600,000, the deaths from this disease were 4,385. But it is not quite certain that this was Asiatic cholera, and indeed the medical men of that day themselves called it cholera morbus. In Hindoo writings we have descriptions of it in the 16th and 17th centuries, but they are unreliable as they confuse other kindred diseases with it. During the years of 1768 to 1769 there was an epidemic of a disease closely resembling cholera which proved extensively fatal, carrying off some 60,000 persons. "On this occasion," as quoted

by Simmons, "the spread of the disease was so rapid, and the deaths so frequent, that the carpenters were unable to keep up with the demand for coffins, and empty *saké* casks had to be employed for the purpose. The graveyards were at length all filled up, no space remained for more burials, and the priests of the various sects refused to permit the interment of the remains, insisting that the bodies should be burned and only the ashes buried. At the various cremation grounds, therefore, coffins in countless numbers were seen piled on top of each other; the burning of bodies being done in regular succession, according to the order of their arrival. Numbers of corpses, mostly of poor persons, had to be left unburied for upwards of half a month, and the headman of the ward was at his wit's end to know what to do in the matter. They were finally, by order of the government, wrapped in mats and, after a brief religious ceremony, were conveyed to the Bay of Yedo, and sunk in the sea." But, coming down to the year 1817, we find

reliable information to the effect that in this year the disease which had hitherto been confined to India, girded up its loins, overspread the whole peninsula, and penetrated wherever mortals lived, leaving in its course the ghastly corpses of millions of victims. For five years this giant stalked abroad; starting from Bengal he turned his face toward the setting sun; ascending the Ganges, through Central India, across the Ghauts Mountains; in one year he reached the western coast of the peninsula. Then to the southward to Madras in 1819, crossed the sea to Ceylon, and during this year visited other islands of the sea. Ubiquitous or omnipresent, whichever he may be said to have been, the Island of Sumatra, the Peninsula of Mallaca, Siam and the Burman Dominions, did not escape his ravages. From having been in Northern China and Tartary in 1820, in 1821 he appeared upon the shores of the Persian Gulf; from here he ascended the Tigris and the Euphrates, and in 1822 passed over the desert into Syria. Making his way northward

through Persia, he reached the shores of the Caspian Sea and captured the Russian City of Astracan in 1823. The whole of Asia having been made to pay tribute in victims to him, he disappeared, apparently satisfied with the devastation he had caused. But, like many another conquerer, his success on this campaign only whetted his desire for conquest. In 1828 we see him knocking at the doors before the town of Ohrenburg, in Russia, and in 1830 he entered the city of Moscow; no terrors of the conflagration were greater than those produced by his appearance. In the midst of gayest revelry the face was blanched by the midnight cry of mourning and of woe; where, but a few hours before, all had been prosperity and gladness, now there reigns a terror as of death. Through the streets of the city, into the hovel of the serf and the palace of the rich, he goes without let or hindrance, beckoning here the old grandfather, there the new-born babe, or again a whole family to follow him, making great seams and chasms in the

hearts of thousands. Hastening on westward he attacked St. Petersburg, Warsaw, Dantzic, Berlin, Hamburg, and crossed to England in 1831.

He appears to have taken to himself the power of self-multiplication, for at this time he appears in Paris, London, Quebec and Montreal; he has overleaped the barrier presented by 3,000 miles of water and attacked a new continent. As now we approach within the ken of those who are living to-day, and perhaps within the sacred precincts of some recollection saddened by the loss of friends, let us drop the figure and quietly follow the march of the terrible scourge. On the 24th of June, 1832, it appeared in New York and spread both northwardly up the Hudson, and southwardly to the Delaware and Chesapeake Bay. About the time when, under other circumstances, the good old burghers in the city of Albany would, in their quiet old-time way, have been celebrating the day of our Nation's pride, the authorities were busy devising means to stay

the approach of a disease which had already made havoc among the poor of their sister city. The scourge found them as though it had come "like a thief in the night." They had neglected the proper precautions and the fell destroyer entered upon his ghastly work. The same is true of other cities in our fair land; Philadelphia, Baltimore and St. Louis were all sufferers that same month. For nearly two years there were a few cases here and there in this country and then it entirely disappeared. In the meantime Syria, Arabia and Egypt were invaded until, finally, having exhausted itself seemingly, the disease disappeared from view. This was only its season of rest and recuperation however, for in 1847 accounts were received that it had a third time left its home in the delta of the Ganges, taken up its march of conquest and was pursuing the same route it had on previous occasions. Passing with terrible destruction through the cities of Persia, it reached Astracan and Moscow, in which latter place it rested for the winter. With

the advent of spring it attacked St. Petersburg, Berlin, Hamburg, Edinburgh and London; thence to New York and New Orleans. At the former American city it was checked by quarantine, but in New Orleans, the weather being very hot, and other things favorable for its reception and propagation, cases multiplied rapidly, and soon it had extended into Texas and up the Mississippi to Memphis. The next year (1849) following its appearance in Europe, it broke out in New York, Philadelphia and many other places on the Atlantic coast. Starting afresh in New Orleans, it overspread the valley of the Mississippi, took up its habitation with those who were toiling over the plains to their El Dorado, and caused many an one to stay his westward course and lay himself down to die amid the sage brush and the cactus. It reached Sacramento; it went even to the Golden Gate and there it rested. Not from thence departed, for during nearly six years there were cases frequently appearing in this country, milder exhibitions of the epidemic at

various points, until finally we find ourselves relieved of the oppressive visitor. A fourth time India sent her poisonous breath throughout the continent and slew more victims than the armies of Europe's conquering hero claimed. Reaching Mecca in 1865, the pestilence found a rare place in which to thrive. It is a sacred place and sacred season; Mohammed's loyal followers have met for worship at their shrine. Weary and worn by their long pilgrimage, poor in purse and wretched in condition, they exist in the midst of squalor most profound. An official from the temple brings them "cakes of sacred bread; these cakes were made of meal, one-third of which is composed of sand and grit, and the remnants of obnoxious insects. Another day the food is half-boiled rice, not cleared of gravel, bran or grit, and little cakes made of this with old and rancid glue. To render this food more sacred the cakes are kept in the temple for some days before they are consumed. Having been thus offered to the presiding deity of the place, they

must be eaten by the pilgrims and that with apparent relish, for it is sacrilegious to examine too closely the composition, and it is blasphemy to find fault with it at all.”* “The city of Mecca, lying in a basin, contains a permanent population of about 40,000 souls, and annually, during the Hadj (pilgrimage), from 100,000 to 150,000 pilgrims, who become residents for periods varying from one week to three months, crowd into it. This vast influx of strangers finds accommodation where it can; the well-to-do rent rooms, the poor live in the streets. The houses in Mecca are generally built in flats to accommodate pilgrims; each flat is provided with one or two badly constructed latrines, and there are from six to twelve of these in each house. These latrines empty themselves into pits dug outside the houses; when these get filled they are emptied into other pits, which are made in the streets or any other convenient spot, and then covered over with earth. For the poor

* British Medical Journal.

latrines are made on the same principle, in and outside the town, and the same method of emptying them is employed. This system of burying foul matter in every direction has been pursued for centuries; it is not, therefore, surprising that the ground in and around Mecca is surcharged with excrementitious matter, which rains (these are frequent in Mecca) carry by filtration into the wells. One of the principal of these, and one most used, is called Hagar's well; it is not a spring, but its water is supplied by filtration—that is, by rain-water passing down through an overlying mass of foul matter. In addition to this, pilgrims by the thousand, sick and well, diseased and sound, daily wash beside it, when the water used naturally finds its way into the well.”* What better allies could cholera have than such food, such water, such houses and such squalor? Re-enforced at this point, it passed into Egypt, making fearful ravages in Cairo and Alexandria. Dividing here, it

* Medical and Surgical Reporter.

moved along the coast of Syria and Asia Minor up to Constantinople, encircling the Black Sea in its embrace; at the same time visiting Italy it spread along the coast and into the interior. During the month of October it attacked Gibraltar, Barcelona, Madrid and other places in Spain, as also Marseilles, Toulon, Paris and other places in France, getting into England just as the frost came. From that time forward, for twelve years, certain places were subject to outbreaks of cholera; in 1866-67 it made its appearance in New York but was at once stamped out. Too much praise cannot be awarded to the health authorities for the prompt and efficient action taken at that time; quite a large number of cases occurred in New York, Brooklyn and the harbor, but the spread of the disease was prevented and no panic was caused. Compared with the epidemic of 1849 in New York, when cholera was allowed to exist from December to the early part of May without any attempt being made to put the city in as good sanitary condition

as possible and in consequence nearly 5,000 deaths occurred, it is a brilliant illustration of the value of local hygienic measures. In 1877-79 China and Japan suffered severely, and the excellent report we have of that epidemic* makes very clear the necessity of promptly putting into execution the best measures for preventing the entrance of a disease to a country. The reports of the last epidemic in Naples, as published in the "Medical News,"† furnish the same line of evidence. "August 2, 1884, the first case of cholera was reported in Naples, and the patient removed to the Conocchia Hospital, where he died. From that time the disease made gradual progress, of the course of which there was no official report, the fact of the existence of cases being published in a desultory way, no particular importance being attached to them, seemingly. They were said to have been sporadic and no fear was felt as

* Op. Cit. † Medical News, Nov. 1, 1884

to their spreading so late in the season. There were others who thought the disease was smothered for the time being, to break out with renewed force in May, 1885, when they expected a gradual increase, followed by an outbreak similar to that of 1836-37.

The disease finally manifested itself in a decided manner on August 23. The former indifference of the authorities was changed to the greatest activity and anxiety; the portion of the city most exposed to the fury of the disease was the Parto. It rapidly spread to the Mercato, Pendino, and Victoria, the former of which outstripped the Parto in the number of deaths, and has maintained the foremost position during the epidemic. On the 11th of September the highest point was reached, the bulletin of that day giving 949 fresh cases and 357 deaths; this was followed by 843 fresh cases and 386 deaths on the 12th, 698 cases and 281 deaths on the 13th, from which date there was a gradual decrease in both cases and deaths. On September 22 the cases had fallen to 305

and the deaths to 97 within a period of twenty-four hours.

The eyes of King Humbert and his ministers have been opened, as they never were before, to the true state of affairs among the poor of Naples, and the result may be the opening out of new streets through the four sections into which the fresh air of the bay and the purifying rays of the sun may enter freely; and a further result, a new system of drainage, not only for these sections, but for the remaining eight." It has been well said that efficient quarantine does protect, but after the germs are once introduced no quarantine regulations will serve—nothing then but local hygienic measures will suffice. Neglect to take precautions cost Japan in 1877-78 many valuable lives and produced much serious disaster. In view of the fact that the past year has seen the dread disease attacking one place after another on the Continent, the question becomes an important one: What are we doing as a government to protect ourselves from its ravages? Objections are made

by some to any inspection of ships coming from infected ports, just as they are made by others to the inspection of buildings and yards. There is almost without exception a disbelief in the local existence of a case of Asiatic cholera. Why persons should be so skeptical as regards the existence of individual cases of this disease and the danger from them is inexplicable on any other ground than that of self-interest. There are persons who are so skeptical as to distrust not only external testimony, but the evidences of their own senses, it is true; but the fear that trade will be interfered with and business decreased if the public mind becomes pre-occupied with the idea of danger from an epidemic, leads many men to treat the matter with culpable skepticism. These are the ones who present manifold obstacles to the prosecution of any measures looking toward the prevention of disease; they are found on every hand—in our halls of legislation, obstructing the passage of bills for the appropriation of money; as members of committees to wait upon

officials and argue against just sanitary legislation; as members of social and business circles, endeavoring to divert individual minds from the contemplation of facts which would tend to kindle a public sentiment in favor of hygienic measures. We find them on school boards, refusing to vote for appropriations for heating, ventilating, and draining the school-houses. We find them as property owners, neglecting to put their buildings into such conditions as will render the occupants safe from zymotic or other diseases. Thinking to protect their own interests, they work against the public weal, and thus do injury to themselves. The appearance of cholera the past year in Europe leads to the important question: Shall we have it in this country? The history, as we have seen, makes the answer, it is probable we shall. Men may call it sensationalism to agitate the matter, but with the knowledge we have of former epidemics, and the danger attending neglect of thorough measures to prevent its ingress, it would be wrong not to make an endeavor to

inform the people how they may protect themselves from infection. Much has already been done by the general government and the various state and municipal authorities in the direction of a thorough quarantine and disinfection of persons and goods arriving in this country from infected ports, but experience teaches that even the most vigorous quarantine does not prevent, now and then, a case getting in. What has actually been done in any city, town or village to meet such an emergency? Are there hospitals ready for the reception of patients? If one case occurs, it is the source from which there will arise many, unless active measures are adopted to prevent it. There is a disposition not to report such solitary first cases. Have the necessary arrangements been made for an inspecting corps? Are the details for disinfecting provided for? Are the people thoroughly instructed as to the measures they must adopt to render the spread of the disease impossible? Are the authorities of cities, towns and villages

taking active measures to cause the removal of all filth and disease-breeding material which is the favorite *habitat* of the cholera germ? We say the authorities of towns and villages, because facts prove that in many places there is much more carelessness in regard to drainage and the purity of water-supply in the rural districts than in cities. The experience of the residents in the little village of Plymouth, Penn., is an illustration of this. No attention was paid to the disposition of sewage; the water-supply was left to take care of itself. The number of cases of typhoid fever which resulted has now reached 905. A warning sounds with clarion voice to every town and hamlet, large and small, and it behooves the inhabitants, one and all, as well as the authorities, to attend to these matters. The author does not wish to seem an alarmist, neither does he desire to appear sensational. The foregoing questions are simply those which occur to every one who considers carefully the present condition of affairs. These are impor-

tant matters, and if not already attended to, ought at once to be looked after. One of the great difficulties in any epidemic is the panic that comes upon the people; every one thinks something ought to be done and nobody knows just what to do; to be forearmed is to be cool and collected when the time for action comes.

As an illustration of how a panic may be produced, we have only to turn to the record of the epidemic in Quebec in 1832. "On the 11th of June of that year it was publicly announced that the malignant, or Asiatic cholera had appeared at Quebec. On the 12th of the same month, the Board of Health of Montreal stated that there was no case of *malignant* cholera, although several patients had died of the common cholera of the country. On the 18th, only six days later, we find reported 2,516 cases and 437 deaths, but even this was thought at the time to be below the true estimate; the panic was so great that it was impossible to keep any accurate account of the numbers that sickened or died."*

* Epidemic Cholera—Coventry.

When the accounts of the panic which prevailed in the epidemics of 1832 and 1849 are reviewed, the almost brutal interment of the dead and the desertion of friends, noted, the prevention of a repetition of such scenes is devoutly to be wished. There are no measures for preventing a panic more effective than the dissemination of such knowledge as will cause individuals to feel that they can, and have, put their persons and premises in such condition as to prevent an attack.

CHAPTER II.

CHOLERA—ITS CAUSE.

Just what factors are necessary to produce cholera as it appears in its home in the Delta of the Ganges is unknown; it is now believed to have been pretty conclusively proven that each of the various infectious diseases is due to a distinct specific causative agent, and that this agent is probably a living organism. For a long time this had been suspected; nearly half a century ago the statement was made that certain diseases had their origin in a ferment, and when Pasteur demonstrated that various ferments were micro-organisms, the supposition grew into a theory, and, under the investigations of Strauss, Roux, Virchow, Koch, and others, the theory has become an

established fact. The announcement by Koch that the germinal cause of cholera had been discovered by him caused, among scientists, an excitement in proportion to the interest centering in the disease at that time. It was on the 26th of July, 1884, that he gave to his associates in Berlin the results of his investigations of the disease in Egypt, Calcutta and Toulon, and affirmed that a little organism shaped like a comma (,), so small as to be seen only with a high power under the microscope, was the essential cause of the terrible pestilence. Immediately other investigators took up the search, some confirming and others denying the statement. It is not at all to our purpose to follow the discussion of these scientists in detail, nor, indeed, even to indulge in any thing more than a brief sketch of some of the arguments in favor of the theory advanced by Koch. He examined a large number of cases of cholera, and found in each the little comma-bacillus; he did not find the true comma-bacillus in the healthy body, nor in

cases of disease other than epidemic cholera. Two Swiss physicians, Rietsch and Nicati, in the laboratory of the Pharo Hospital, at Marseilles, successfully inoculated a number of guinea-pigs, dogs and rats with cholera microbes, and within two days the guinea-pigs died, after having exhibited the symptoms of cholera as seen in human beings; the dogs died in about four days after inoculation, having exhibited the same symptoms. Koch himself afterward confirmed this experiment. This was a crucial test, and seemed to furnish conclusive proof that the comma-bacillus bore a causative relation to cholera. These experiments are in a line with those to which Bernard refers in his "Introduction to the Study of Experimental Medicine," when he says, "The experiments on animals with deleterious or noxious substances are very useful and perfectly conclusive for the toxicology and hygiene of man," but to which the antivivisectionists so strenuously object. Let us see what conclusions these men drew from

their work. "There is a practical mode of diagnosis in all doubtful cases of cholera; in such cases it would be sufficient to repeat with the contents of the patient's intestine the direct inoculation into the duodenum of the guinea-pig to ascertain whether it was a case of cholera or not. The second conclusion which they drew was a prophylactic one, viz., that the gastric juice and the bile digest the microbes very thoroughly. These two juices are excreted in large quantities during the digestion which follows a meal, so that impure water would be less dangerous when taken with food than when drunk by itself."* Do not these conclusions warrant the means employed? If true, the experiments upon which they are based may be made to relieve great anxiety or protect from much disaster. The life of a human being is of more value than many guinea-pigs. But to return from our digression; while in India, Koch found a water tank the water in which contained an abundant

* Dr. Austin Flint, Sr., reported in Med. News.

supply of the comma-bacillus, and when an outbreak of cholera occurred it was found that the inhabitants had been, and were, using the water; when the microbe disappeared from the water the disease abated, and in the places where the disease did not exist he did not find any comma-bacillus. These are, in substance, the facts as published in the "London Lancet" for September 20, 1884. They seem to prove that the comma-bacillus is the essential cause of cholera; there is need of confirmation by further experiments before they can take their place among indisputable conclusions, but they are pretty generally regarded as an explanation of the origin of cholera in places outside of the locality in which the disease is said to have its home. The older writers on cholera speak of the specific cause as being "a peculiar epidemic influence," and say that various circumstances increase the susceptibility of the system to this influence; that others hasten the attack, and still others call into operation a latent tendency to it, and so

cause its development. However this may be, there certainly are conditions which serve to develop the disease in localities and individuals, as we shall see when we come to consider some of the assisting causes and review some of the measures for its prevention. The theory of an epidemic influence seems to find corroboration, in the opinion of some, in many of the circumstances occurring during a season of cholera visitation. One of these is that a number of cases of some particular disease occur just previous to an outbreak of cholera; another, that so many are stricken down at the same time in different places who apparently have had no communication with each other, nor with any infected district; still another, that ships sailing upon the ocean have suddenly developed on board cases of the disease. As regards the first, it is not well proven; it is a fact that during an epidemic of cholera there are numerous cases of intestinal disturbance, but these may be accounted for on the supposition that an advanced guard, so to speak, of the epi-

demic gains an entrance to the body, but, not finding there the conditions under which it thrives, serves only as a slight irritant and then passes away; in regard to the second and third, the germ theory of disease accounts for them much more satisfactorily than any other. There are certain well-established facts in connection with the epidemics that have occurred heretofore which substantiate these assertions. First, it has frequently been observed that the dejecta from persons suffering with simple intestinal flux have produced cholera; second, as has already been mentioned, it, in the majority of cases, starts from India, although Dr. Elisha Harris says: "Cholera has prevailed extensively in the United States during eight out of the forty-one years since its first appearance on this continent. But in only four out of the eight years, as we have reason to conclude, was this pestilence freshly introduced into the United States from Europe. The new importations of the exotic germinal cause were abundantly witnessed in the years 1832, 1848—

49, 1854, 1865-66.'''* It follows the lines of travel pursued by armies, caravans, pilgrims and transports through and over the waterways of Europe. It moves with the merchant marine to this continent, where we can trace it over all our routes of travel, along the canals, railroads, rivers, lakes, across the plains; everywhere man goes, it goes. Man is the chief carrier of the disease. We notice, too, from the history, that it extends most rapidly where there is the greatest aggregation of men, and that among the class of people with whom squalor is a constant condition, whose houses are dirty, whose persons are unclean, and whose surroundings are filthy, the disease runs riot during an epidemic. These circumstances lead to the conclusion that there is a specific cause and man is the chosen vehicle for the transmission of that cause. We observe, too, that in a city attacked by the disease there is sometimes a distinct line drawn between the infected and the uninfected district; one side

* Report to Am. Pub. Health Ass'n by Dr. E. Harris, 1874.

of a street will be affected, the other will escape; the upper story of a house will be free, while the lower may have two or more cases, which would tend to prove that the cause is not an epidemic influence, but a distinct germ, which, finding in certain restricted localities the necessary conditions for its growth, develops into virulence. We have seen that in Mecca when the city was crowded with pilgrims who drank of water made foul by centuries of unsanitary practices, and polluted by themselves, there was a terrible re-enforcement of the disease. Similar occurrences took place in India, China and Japan before the systems of sewerage now in operation were completed, and with the removal, by this new sewerage system, of the contaminating material from the water supply, the violence of the epidemics has been very much diminished. When we consider that in these places, with the exception perhaps of a portion of India, cholera does not exist all the time, but the water is drunk constantly, the question at once arises: Why is

this so ? For answer we look to the reports of Commissions appointed by several governments to investigate this very point, and we find that in probably every case the disease was brought by some person or persons coming from an infected district, and the germs of this disease gaining entrance to this polluted water, found there the very best conditions for their rapid development. Enough has been said to indicate the reasons why cholera is supposed to have its origin in an organism. That the comma-bacillus is this organism is stoutly denied by many investigators, and the reasons given for this opinion are certainly entitled to consideration. Some of these men admit that the comma-bacillus, while in and of itself harmless, yet does excrete a virus, under certain conditions, which produces cholera; but, as has already been said, it is not our purpose to follow all the arguments *pro* and *con*; those who desire to do so can find them fully set forth in the reports of the various cholera commissions, as published for the several Boards of Health.

CHAPTER III.

CHOLERA—ITS PROPAGATION.

The fact admitted that the origin of cholera is a germ, it will be profitable for us to consider, before studying measures for the prevention of an epidemic, some of the assisting causes, or, in other words, some of the means by which the germ is propagated when once introduced. It is a self-evident proposition that to keep it out is the best thing to do, but this cannot always be done, and if those conditions which aid its development are understood, preventive measures will be plainly indicated. There are those who denounce quarantine as barbarous and, at best, ineffectual, and consequently useless. While there are many objectionable features connected with

systems of quarantine, instances are not wanting which demonstrate its value and show the evil result of its abandonment. When Denmark, which had been frequently exposed to the danger of cholera infection from other nations, but had always escaped through the strict quarantine she maintained, for the first time removed this, an epidemic occurred in the country, in which there were 7,000 cases with 4,000 deaths. The quarantine was then re-established, and there has been no more cholera there up to the present time. The same thing was true in regard to Greece. Although quarantine may not be competent to prevent the ingress of every case of infectious disease, it is a safeguard of inestimable value at ports of entry, and its maintenance in an efficient manner is a matter upon which inland towns, especially those situated upon the great water-ways and routes of travel, have a right to express an opinion, and a right, also, to expect that their opinion will be regarded. Among the assisting causes of cholera, we may

mention, first, that of fear. It is well known that there is no moral influence which produces so depressing an effect on the system as fear. It has been clearly proved that the most vigorous of men, even in the most perfect health, may be frightened to death. Instances were not wanting during the war of the Rebellion where soldiers were so overcome by fear from an impending battle as to be thrown into a violent intestinal flux, which rapidly reduced them. If we only look at a frightened person, we see that he presents almost the first symptoms of cholera; the blood retreats from the surface to the central organs of the body, leaving the face pale, the hands cold, and the pulse feeble; indulged in to any extent, it reduces the resisting power of the system, and the person falls a victim to a disease which might not have attacked him at all, or have proved so light as to have produced no serious consequences. Furthermore, it interferes with the discharge of those duties upon the faithful discharge of which the safety of the person,

and perhaps the household, depends. It serves also to spread the disease; a person dreads an attack, and, to avoid it, leaves the place where the epidemic is prevailing; with him go the germs of the disease, they find lodgement in the material favorable for their development, and in a little time cholera appears in that place. An illustration of this is found in a case occurring in the little village of Omergues, in France. The place is a small, closely built mountain hamlet, where few ideas of cleanliness or sanitary prudence prevail. A servant in Marseilles left her employer and went to her home in this little village, taking with her the fatal germ. She and two of her family died, a panic seized upon the little community, and before the disease could be checked twenty-five of the inhabitants had died. Another assisting cause is found in impaired health. This term is made to include every condition that tends to weaken the vital energies, whether it be exhaustion from overexertion, either physical or mental; want of sufficient nourishment; derangement

of the digestive organs by excesses in eating or drinking; debility from exposure or excesses of any kind; the existence of any constitutional disease or the convalescence from sickness; by reducing the vital power they bring the system within the influence of the epidemic cause. Bad drainage is one of the chief allies of cholera. In cities it acts to pollute the atmosphere of dwellings, and, when accompanied by poor ventilation, surcharges the air with noxious gases, and the vital functions are so materially interfered with as to produce a condition of the system which renders it very susceptible to the epidemic cause of the disease. In the country it leads to the deposition upon the surface of the ground of a mass of decaying matter, which serves as a breeding place for the cholera germ and causes the pollution of wells, cisterns and other sources of water supply. In many places the drain is nothing more than a ditch, in which lies a mass of putrefying matter exposed to the rays of the sun and exhaling poison along its whole length; in

other cases it is covered, but having been constructed of wood, this decays and permits the contents of the drain to escape and filter through the soil into the cellar or well. This leads directly to the consideration of another assisting cause, and that is filth. Decaying vegetable and animal matter in or around a dwelling is in violation of one of the oldest and most important sanitary principles. Such material, if not the breeder, is a harbinger of the germs of very many diseases, and of none more so than of cholera. In the history of every epidemic we find those places low-lying, damp and dirty invariably attacked. The disease is not always confined to them, it is true, for causes may be operative to make it appear in places scrupulously clean, but places abounding in filth are never exempt. The lower portions of large cities, where the streets are narrow and buildings high, so that the sun can never reach them, where all the refuse from the houses, it would seem, is thrown into the roadway, creating such a stench that one almost

fears to breathe while passing through, where women and children vie with each other in seeing which can present the most wretched appearance, where the homes (?) are the acme of filth and misery; these portions are the first to be attacked in an epidemic, and the *foci* from which radiate thousands of disease germs. Filth is not confined to these portions of the town, however; oftentimes in what would be called well-regulated families there are found vessels filled with decaying garbage, stationary tubs half filled with dirty wash-water, areas in which lie rotting and rusting all sorts of things, the accumulation of months; cellars in the dark corners of which are vegetables long since dead; streets, alleys and yards in such conditions of neglect that the only wonder is that any one can be well. The cholera persistently hunts out such places, and lurks there until it has gathered strength sufficient to attack and destroy whole families. In many places in the country the filthy habit prevails of emptying all the refuse from the kitchen, wash-water,

and chamber vessels upon the ground just outside the house, and for the space of three or four yards square the ground is sodden and slimy. Until the people can be made to change this condition of affairs, zymotic diseases will flourish and epidemics will find plenty of food. The most powerful of all the causes which assist in propagating cholera is drinking water polluted in some way. We have seen that in Egypt and India pilgrims use for drinking the same water they have used for bathing and washing their clothing, and we have seen how terribly they suffered with cholera. There is abundant evidence, amounting almost to a demonstration, that polluted drinking water plays the most important part in disseminating cholera. John Marshall, of the University College, England, has furnished, in a committee report, the most convincing evidence of this; (this is the celebrated Broadstreet pump case). "In Rotterdam, during an epidemic of cholera, the introduction of pure water immediately reduced the mortality to one-half. Dr. Auc-

land relates, as quoted by Dr. Parkes, that two jails were near each other; the inmates of the one suffered, those of the other did not; the water was impure in the one case from drainage, pure in the other. The jail with bad water having got a fresh supply, the cholera did not appear there in the next epidemic. In Haarlem, Holland, cholera prevailed with great intensity in 1849. In 1866 it returned and again prevailed as severely in all parts of the town, except one; that part entirely exempted in the second epidemic was inhabited by bleachers, who, between 1849 and 1866, had obtained a fresh source of pure water.

“Prof. Foerster has shown that five towns of Silesia (of 5,000 to 12,000 inhabitants) are entirely free from cholera, which never spreads, even when introduced. The only common condition is a water supply which cannot be contaminated. In Glogan half the water is from a distance and half from wells; those using the former remain free; those using the latter are attacked. Dantzic and Königsberg formerly

suffered equally; Dantzic having a new water supply, does not suffer; Königsberg, with its original supply, continues to suffer. In Berlin, in 1866, cholera prevailed much more in the houses supplied with bad water than in houses supplied with good water.”* We have already mentioned that in India the introduction of a sewerage system relieved the water supply of much impurity, and in consequence the violence of epidemics is very materially diminished. Impure drinking water is obtained in many of our cities, from several sources. Wells located in thickly populated districts receive more or less of the surface drainage from filthy streets, and much of the water in them comes through soil saturated with pollution of various kinds; it is said that in the city of St. Louis there are 7,000 such wells sunk in the various streets, alleys, courts and yards of tenement and other houses, and surrounded by vaults, stables, cesspools and sewers; in other cities the same is true, though not perhaps to

* Maxims of Public Health—O. W. Wight, M. D.

so great an extent. Rivers and streams, the banks of which are thickly studded with villages, towns, populous cities, manufacturing, dyeing and cleansing, and refining establishments, are taken for the source of a water supply; the filthy stuff flowing in them is pumped into reservoirs, distributed throughout a city, and the inhabitants compelled not only to drink it, but to pay a good round sum for the privilege (?) of risking poisonous infection with every draught they imbibe. The citizens are told by those in whose power they are that water contaminated by the sewage of a city of 50,000 inhabitants will purify itself in a flow of a very few miles, whereas instances without number are on record that such is not the case. We will not occupy space to cite cases, but we cannot prevent the mind of the reader reverting to the fatal epidemic of typhoid fever, not yet over, in Plymouth, Penn., where upwards of 900 persons have suffered from the effects produced by the dejecta of one person having been introduced to the source of water supply at a

distance of several miles above its point of distribution. Such evidence points out the danger at all times lying in the use of water for drinking purposes which comes from a source liable to pollution. At the present time it has an added significance; not that foul water will, *per se*, produce cholera; no amount of bad water will do that; the germ must be implanted. Fear, poor health, bad drainage, want, squalor, filthy surroundings—none of these things will produce cholera, but the disease flourishes amid such surroundings. No soil, however rich, will produce a crop if the seed be wanting, of which proposition the converse is also true—no seed will produce a crop if the soil is not good. To gather up, then, the reflections in this chapter, we may say that the present position of the best authorities, which meets facts as observed, and may be accepted as correct, is as follows: Cholera is the result of the development of a germ; it is conveyed by individuals chiefly, and by the articles soiled by the dejecta of cholera-infected per-

sons; "its poison is contained in, and propagated by, the discharges from the bowels of those infected, which, finding access to drinking water, or resting upon food, gains entrance to the digestive tract of others. It is not certain that in a heavily charged atmosphere the poison may not be swallowed with the air, but the infection must take place through the alimentary canal, and in this very limited sense alone can cholera be spoken of as 'contagious,' thus probably resembling typhoid fever. In other words, an individual who could avoid swallowing the poison, might safely associate with cholera patients, and the digestive functions being quite healthy, he would probably escape, even if he swallowed a moderate dose."*

* Boston Medical and Surgical Journal.

CHAPTER IV.

CHOLERA—ITS PREVENTION.

The means by which cholera may be prevented have already been indicated by the explanation of its cause and the description of the ways in which it is diffused. Its habits, and the factors in its cause and spread, being so well understood, we are warranted in believing that this pestilential destroyer may be successfully resisted, and its material means of propagation be completely controlled. Scientists may differ as to the exact form of its specific germ, physicians may vary in their opinions as to some of the facts concerning the various forms of the epidemic and the most effective treatment, but upon the essential points—sanitary measures as preventive means

—there is as much certainty as there is upon similar facts in the causation and prevention of any other epidemic disease. The fact that in Bombay, Madras, Calcutta and other places where, in former times, the disease made such terrible havoc, methods have been adopted by which the pestilence is shorn of half its terrors, indicates very clearly that similar methods pursued in a country where the disease is only epidemic, where it does not naturally grow, would be efficient to destroy it altogether. When considering the causes of cholera, we took occasion briefly to allude to some views upon the subject of quarantine, and will, at this time, only add that in the enforcement of strict quarantine regulations it is possible, unless great consideration is shown, to work much injury to those whose persons or goods are subjected to them; furthermore, there is apt to be so much reliance placed upon such regulations as to lead to carelessness on the part of those presumed to be protected by them, sanitary precautions are neglected, and they

are rudely awakened from their dream of fancied security to find the visitor upon them and their house not ready to receive him. The fact that cholera is transmissible is beyond question; so also is the fact that it does not fatally attack all the individuals exposed to its influence. A well-regulated life and good hygienic conditions are almost certain guaranties against its action; it rages by preference in unhealthy localities, among populations weakened by misery and among individuals whose powers of resistance are undermined by disease or excess. All these circumstances are, to a large extent, under the control of individuals, and, in so far as they are, it is for each one to decide for himself whether or not he will be attacked by the disease. We have seen it is not contagious, in the wide sense of the word, and so there is no need for that morbid fear which only renders its subject the more liable to be attacked; if, however, there shall be a wholesome dread which will lead to the enforcement of strict sanitary rules in every

household, much good will be accomplished. Observation has shown that cholera is a pestilence which is nourished in a locality where there is stagnant water and marshy ground, and that such places when visited by it become *foci* for the further distribution of it. It becomes, then, a matter of the highest importance that such places be reclaimed from their unsanitary conditions. An hour's ride through almost any city will bring to view large areas covered with stagnant water or reeking with the decomposition of material left after the water has evaporated. The local boards of health endeavor to reclaim such places, but frequently they are met by the most violent opposition from those who should be foremost in promoting the public welfare. It is the duty of the authorities to co-operate with the board of health in these matters and to see that such places are put in a safe condition; if the doing so works an injury to individuals, liberal appropriation should be made to compensate for such injury. Landlords and owners of houses

in towns and cities should see to it that the drains in their houses are in proper condition, so that the atmosphere may not be contaminated with emanations from sewers, sinks and cesspools. Occupants of houses should make sure that there is nothing in or around the house, in cellars, areas, back-yards, alleys or out-buildings, which, by its decomposition, shall pollute the air. The rich suffer equally with the poor when surrounded with a polluted atmosphere, so that it becomes a matter of general concern. In the country, out-houses, pig-pens and chicken-houses should be kept clean and privy vaults disinfected daily. A foul air, at all times, undermines health, but when an epidemic comes it renders the mortality very much greater than it otherwise would be. The medical officer of the Privy Council of England, as quoted by the late Dr. Harris in his report already referred to, says: "The specific migrating power of cholera, whatever its nature, has the faculty of infecting districts, in a manner detrimental to life,

only when the atmosphere is fraught with certain products susceptible, under its influence, of undergoing poisonous transformations. Through the unpolluted atmosphere of cleanly districts it migrates without a blow. That which it can kindle into poison is not there.”* “There is a small colony of Moravians at a place called Sarepta, situated in the bend of the river, which has been noted by travelers for its neatness and industry. Dr. Verollot says the cholera itself seems to respect this sacred spot, passing by both in 1830 and 1847 without inflicting on it the least injury.” The sanitary condition of the place is the most important thing to be attended to. Local boards of health can do much of this, but not all; the citizens themselves must be willing to co-operate with them. There ought to be a strong public sentiment in regard to the matter, so that when a question of sanitation comes up for consideration it will have the attention and support of the public; if this was

* Conclusions Concerning Cholera—Elisha Harris, M. D.

the case, there would be much less cause for complaint that unsanitary conditions remain unremedied. Too often the people, as well as the authorities, when notified of such evils by health officers, receive the information with an indifference and apathy, if not a spirit of opposition, that is quite discouraging. We expect some opposition from the poorer classes and the uninformed whenever the enforcement of sanitary rules, such as vaccination, isolation, disinfection, drainage or ventilation, is attempted, but from the better class it ought not to be so. With more effort on the part of those who know and realize the importance of these matters, information might be furnished that would prevent all annoyance. The introduction of the study of hygiene, the laws of health and the elementary principles of sanitary science into our public schools; a sermon preached once in a while upon the subject by clergymen, especially those having the spiritual oversight of congregations composed largely of a class of people who, if appearances are any

indication, are either woefully ignorant or else care but very little for personal cleanliness or the purity of their surroundings, would materially assist in this result. Certainly the bearing of this subject may be shown to be very direct upon those higher principles which clergymen are selected to teach and exemplify. A law enacted which would be something more than a "dummy," whereby persons could be punished for not exercising the proper care in such matters, or the execution of such laws as already exist, would furnish some wholesome examples, now and then, by way of a reminder to the willfully negligent. Judge Dixon, of New Jersey, in a recent charge to the grand jury at Paterson, said: "If a man, conscious that he carries about with him the germs of a contagious disease, recklessly exposes the health and lives of others, he is a public nuisance and a criminal, and may be held answerable for the results of his conduct. If death occurs through his recklessness, he may be indicted for manslaughter. The man may be

indicted also for spreading the disease by conscious exposure of others thereto, by his presence in public places, such as on the streets, in halls, etc. He might be indicted for endangering the public health in this way, even if no consequences had followed. The law provides some penalty for such offenses against the public safety.”* The man who maintains a nuisance is amenable to the law if he does not abate it when notified to do so, because he endangers the public safety. The man who maintains his premises in an unsanitary condition endangers the public safety equally with those mentioned, and ought to be punished as well. The prominent part an impure water supply plays in the spread of cholera has been dwelt upon at some length in the chapter on “Propagation,” and its importance requires that emphasis should here be laid upon its removal. Impure drinking water not only serves as the medium for the transmission of the cholera germ during an epidemic, but it ever

* Medico-Legal Journal.

threatens the health and life of the persons using it. Wells in localities rendering the pollution of their waters probable should be so strictly guarded, and if need be closed, as to render it impossible for persons to obtain water from them for drinking purposes, and boards of water commissioners ought to be compelled, if necessary, to protect the sources of their water supply from pollution. This would be impossible in the case of a supply taken from large rivers or from streams upon whose banks there is either much population or manufacturing establishments. These are inevitable sources of pollution, the possibility of removing which not existing, such sources should not be taken for a water supply.

Thus far we have considered preventive or precautionary measures as relating to localities not already attacked by an epidemic disease. We have seen that thorough systems of drainage and sewerage, removal of filth and offal of every kind, good pure air and wholesome water, will do very much towards protecting a

community from an attack, but all these precautions may fail to prevent some cases gaining access to a city or town. It will be well, therefore, to review some of the measures necessary to prevent the spread of cholera, should cases of the disease actually present themselves. One of the most important of these is personal hygiene. Cleanliness of person and clothing—the free use of soap and water—has been the means of saving the health of many a person. What has been said of clean streets, clean air and clean water is just as true of clean persons; the cholera germ abhors them. Moderation in eating and drinking is also important, for, as we have seen, it is possible for the fluid of a healthy stomach to digest, and so destroy, the virus of cholera; not so with that of a stomach wearied with the labor necessary to dispose of an inordinate amount or variety of food, or wrought up almost to a condition of mutiny by floods of alcoholic or brewed liquor having been poured into it. As when a person is fatigued to excess by mental or physical toil

he readily succumbs to the malign influence producing pneumonia, so when the digestive organs are overtaxed the alimentary canal is in poor condition to resist the invasion of the cholera germ. Plain, wholesome, nutritious food, in sufficient quantity, with no excess in the use of tobacco and liquor, fortify the system under almost all conditions; in times, however, when cholera is present in a place, some extra precautions will be needful. Heat destroys the cholera germ; hence no food should be partaken of unless thoroughly cooked. Such articles as cannot be subjected to this process should, in a season of cholera visitation, be dispensed with. This does not apply to such vegetables and fruits as can be peeled or pared; these articles having been cleansed and the rind removed, may be eaten, provided they are fresh and ripe, and not over-ripe. The reason why fruit oftentimes provokes disturbance when eaten is because it is either unripe, over-ripe, or because it has been kept so long as to have allowed the process of decay

to begin. The possibility of the transmission of infectious and epidemic diseases through the agency of cow's milk is established beyond a question. Nearly fifteen years ago an epidemic of typhoid fever raged in a little town, and most careful investigation was made to discover, if possible, the cause of it; finally suspicion pointed to the milk supply, and it was the pronounced opinion that the virus was disseminated through that medium. Since then much attention has been given to this source of transmission, and a large number of epidemics have been traced indubitably to milk which had in some way become contaminated by the virus of an infectious disease. "Dr. Thursfield, an English Medical officer of health, who has investigated the subject of milk epidemics very carefully, proposes certain precautions which he considers effectual in preventing these outbreaks of disease. The responsibility is divided between the consumer and the sanitary authorities. He urges upon the consumer the precaution of boiling all milk. There is a

prejudice against this practice, but it ought to give way if it be true that 'to boil milk may, for practical purposes, be said to confer immunity from infection conveyed by it.' The milk shop of the retailer and the dairy of the wholesale purveyor should be placed under the strict control of the sanitary authorities, which should be clothed with power to make proper regulations and to enforce them by the aid of efficient inspectors."* Just how the milk becomes infected it may be difficult to say in every case; the vessels in which it is contained may become contaminated, or the water with which it is sometimes adulterated may be the bearer of the specific germ; but that it is, at times, a medium for the dissemination of disease germs, is beyond question. And yet it is impossible to detect the virus in most cases by any form of investigation or analysis; hence the force of the remarks just quoted. There should be strict sanitary care (and official inspection if necessary) of all

* Med. News, Nov. 29, 1884.

dairies and milk shops, and the milk should be boiled before being used by the consumer. What has been said in regard to milk is pre-eminently true in regard to water. No water should be used for drinking or culinary purposes that has not been boiled and carefully protected from the air. By the process of boiling, the germ, if the water contains any, is killed; but if the water is then left to cool in open vessels it is liable to re-contamination; it should therefore be bottled before being put away to cool. Boiling not only kills the disease germ, but it "kills" the water too. Any one who has tasted boiled water knows how insipid it is. This flatness may be removed to some extent in several ways; a few tea leaves may be put into each bottle just before the boiling water is put in; this will not make tea in the ordinary sense of the word, but it will materially relieve the insipidity. A little lemon juice added to the water improves the taste very much, and also serves the purpose of supplying to the system a very useful sub-

stance in cholera times. It has been shown that the cholera germ can only live in an alkaline solution, that a neutral solution is unfavorable to its rapid development, and that a solution in which there is the least trace of an acid is fatal to it in a very short time. This would suggest the propriety of drinking lemonade and other acidulated drinks, in moderation. Great caution should be exercised in cholera times in the use of lettuce, chopped cabbage and other vegetables which it is customary to eat without cooking; the vinegar usually used with them serves somewhat as a protection, but should always be put on and allowed to stand for a few minutes before the oil, if any used, is put on. Care should be exercised, too, as regards the use of ice. While ice cut in the winter, preceding an epidemic, would not be likely to contain the germ, it nevertheless may become the medium for its transmission; it presents one condition favorable to its development, that is moisture. Freezing does not kill the germ, it only arrests its growth;

finding a lodgment on the ice, and so an entrance to the refrigerator, this microscopic fiend would be ready at the first opportunity to pass from the ice to the meat, vegetables, milk, or any other food that might be placed near it. The best modern refrigerators have a distinct compartment for the ice, entirely separate from those in which the articles of food are kept; where such are used precaution is only necessary when the ice is taken from them, and put in the water, or on the butter, or in any other way is brought in contact with the food. It will be seen from the foregoing remarks that the main object to be kept in view is to prevent the cholera germ from entering the alimentary canal. Dr. Simmons, reference to whose report on the cholera epidemic in China and Japan has been made several times in the preceding pages, has passed through a number of cholera epidemics in Europe and Asia, and seems to fear the disease no more than chicken-pox. Neither he nor his attendants have ever suffered an attack,

and he attributes their immunity in very great measure to the adoption of such precautions as those already mentioned. That there may be still further safety provided, disinfection will necessarily be resorted to — disinfection of vaults, cesspools, sewers, drains, waste-pipes, water-closets, cellars and all parts of the house where possibly there might be material or place in which the disease germ could thrive. In case a person is attacked with the disease, thorough disinfection of the room, the material evacuated from the bowels, and the clothing soiled by these, or in any other way by the patient, will be absolutely essential. Of the various disinfectants we shall speak more particularly in another chapter. Cholera comes on insidiously and runs its course with great rapidity. In this disease the expression, “While there is life there is hope,” is as true as in any other, but all authorities are agreed that the golden opportunity for curing the patient is during the preliminary diarrhœa. It is the more important to remember this, as the

bowel trouble is attended with little or no pain; there is an inclination to go to the closet somewhat more frequently than usual, but, there being no pain—nothing but a slight feeling of weariness—suspicion is not aroused until the patient is suddenly prostrated; discharge follows discharge, vomiting sets in, violent cramps seize the poor victim, a death-like pallor overspreads the face and form, the eyes are surrounded by dark blue circles, a cold, clammy, but very profuse perspiration bathes the skin, the patient grows weaker and weaker, and soon enters the stage of collapse; even to this time the mind has remained perfectly clear, but now its torch flickers and goes out as the spirit takes its flight from the tortured body. The disease is of too serious a nature, runs too rapid a course to warrant me in giving, in this place, any methods for home treatment; I shall offer in their place one or two cautionary suggestions. On the appearance of the slightest diarrhœa in a cholera season, see your family physician; do not wait

to take a little medicine, laxative or astringent, as your judgment may decide, thinking that on the morrow, if you are not better, you will see the doctor; remember the golden opportunity is just at this time. Beware of advertised "Sure Cures for Cholera;" "there is death in the pot." Your trusted family physician is the one to consult, and his prescription will be the safest for you to follow. Having thus briefly stated some of the more prominent facts in regard to cholera, we come now to consider a little more in detail some of the things which make for better health of communities and individuals.

CHAPTER V.

THE HYGIENE OF FOOD AND DRINK.

When the preventable causes of disease are considered, especial attention must be paid to the purity and wholesomeness of those articles which constitute our daily food and drink, and this attention, which is at all times a duty, is more particularly demanded during seasons when sickness is unusually prevalent or epidemics of specific diseases are anticipated. The possible introduction, ere long, of cholera into the United States, and the probable spread of the disease if introduced, renders it incumbent upon us to set our houses in order and to take more than ordinary precautions for the preservation of health. A few remarks, therefore, upon food and its adulterations and water and

its impurities will probably be considered not out of place in this connection.

Our foods, in the ordinary sense of the word, are derived from the animal and vegetable kingdoms exclusively. From the former we chiefly obtain those substances which build up our tissues and repair the constant waste of the body, and from the latter most largely those compounds which by their oxidation develop animal heat and force. Meat, since in some form it makes up a considerable portion of the diet of most adults and is most important as a tissue former, may well receive attention first. It is fortunately, as a rule, easy to obtain wholesome meat in most sections of this country. Fresh meat properly cooked is more digestible and nutritious than that which has been salted or smoked. If care be taken during hot weather that meat be not tainted from incipient putrefaction, no especial precautions need be exercised in the use of ordinary butcher's meat. Beef tea, as usually made, has little or no food

value, and is more of a stimulant than a nutrient. The possible presence of trichinæ in pork is to be borne in mind, and it should be remembered that salting or smoking does not necessarily destroy the parasite, but that a sufficiently high temperature does, so that no risk whatever attends the use of well-cooked pork in any form. Certain articles manufactured on a large scale from various odds and ends, like head-cheese and sausages, are often made from diseased, decayed or otherwise unwholesome meat, and should be used with caution. A specific poison, the exact nature of which is not well understood, is sometimes developed in such foods which is capable of giving rise to the most distressing illness. Fish is, when fresh and not in too large quantity, a generally wholesome food, but if it has changed color or has an unpleasant odor, it is unfit for consumption. Many kinds of meat and fish are now put up in hermetically-sealed tins, and while a prejudice exists on the part of some against their use, this prejudice is not, in the

main, well founded. Many cases of illness alleged to have resulted from the use of canned articles have been shown, on investigation, to have been due to other causes, and while unwholesome meats may sometimes be packed, or small quantities of tin or lead may occasionally be discovered in the contents of the cans, we believe that the danger has been greatly overrated, and that when the best brands are employed there is practically as little risk in the use of tinned as of fresh fish, meats and vegetables. Let it be remembered, however, that when a can is opened its contents should all be turned out, and that if part only is used the remainder should not be allowed to stand in the can, for in the presence of air metallic impregnation is doubtless likely to occur, especially in the case of easily fermentable and acidulous substances.

Milk is a most valuable food, and largely consumed by the young. If pure, it contains all the substances essential to the support of life, but when robbed of its fat by the

removal of its cream or diluted by the addition of water, as too frequently is the case, it is not only much less nutritious, but it may also serve to propagate disease if an impure water has been added. Numerous cases of typhoid fever have been traced to the use of polluted water in adulterating milk, and it would be well if a much closer inspection of the milk sold in our cities could be made. Fortunately skimming and watering are the only adulterations usually practiced, and the common notion that calves' brains, chalk and such like substances are frequently added to milk is a vulgar error. Borax and carbonate of soda are sometimes employed as preservatives, but in the quantities used do no great harm. No easy tests exist by which we can with certainty detect the partial removal of cream from milk or the addition of water in moderate quantity, for the indications of the lactometer are not absolutely to be relied upon, and the amount of cream measured by volume will vary considerably, according to circum-

stances, so that, if the milk supplied us seems of poor quality, it may be necessary to have an analysis made and to resort to legal measures for relief, if they be provided. Skimmed milk, however, sold as such, and at a proper price, is a valuable article of food, the sale of which should be regulated, but ought not to be prohibited by law. Of course it is entirely unfit for the use of infants. The common notion that milk from one cow is to be preferred for infants' use has nothing to recommend it, the mixed milk from a dairy being less likely to be unwholesome. Condensed milk is generally pure and of a good quality.

The butter with which we are supplied is of varied quality, being sometimes poorly made, though genuine, or containing an undue quantity of water or salt, or it may be artificial in whole or in part. Oleomargarine properly made is probably not an unwholesome article of food, but it should be sold on its merits and not as butter. It is sometimes quite difficult to detect it, though a bit of lamp wick-

ing dipped in the suspected butter when melted, lit and blown out after burning for a few minutes will frequently enable us to recognize the sophistication by the unmistakable odor of burnt tallow which may be perceived. Cheese is a valuable food, capable, in part, of taking the place of meat, and is, when well made, wholesome, if not too largely eaten. It should be made from the whole milk, though the much talked of skim-cheeses are not necessarily so bad as they are thought to be by some. Occasionally during the process of ripening cheese develops a peculiar poisonous principle which has not been isolated by any chemical tests, but which renders it highly irritating when eaten. There is no way in which this danger can be guarded against, but fortunately instances of this kind are rare.

We will now consider those foods which are of a vegetable origin. Bread is the staff of life, and flour naturally comes first. It is of many grades, and the highest priced are not always the most economical and nutri-

tious, since by some processes of milling much of the gluten goes into the middlings and bran. Wheat flour is never intentionally adulterated, and bread not very frequently, though potatoes are sometimes employed in its manufacture to cause it to retain more water, and alum is occasionally employed to whiten that which is made from inferior flour. Baking powders, so generally used in making biscuits and cakes, are mixtures of bi-carbonate of soda, with cream of tartar, acid phosphate of lime, alum, tartaric acid and like substances. While those made from soda and cream of tartar are preferable, little dependence can be placed upon the conflicting claims as to purity or impurity put forth by the manufacturers. Powder sold in bulk is generally of inferior strength and should not be used. Oatmeal is an exceedingly valuable food, being much richer in nitrogenous, or tissue-forming matter, than wheat. When of good quality and well cooked it is a most excellent food for both children and adults, especially if eaten with milk or cream.

Rice is a poorer food, being chiefly starch. It should always be steamed and not boiled, for boiling extracts much of the gluten in which it is already deficient. Fresh fruit and vegetables form an essential part of our diet. Only well-ripened fruit should be eaten, and vegetables must be fresh and properly cooked to be wholesome. The common notion that the free use of tomatoes gives rise to cancer is not based on any known facts. Sugar is one of the most important food articles. It is chiefly obtained from the sugar cane, but it is also made from the sugar beet, sap of the sugar maple and from sorghum. Granulated and loaf sugar are almost perfectly pure, and the notion that sugar is adulterated with sand, marble dust and the like is an error. Low grade sugars are mixed with grape sugar (starch sugar or glucose), and this is a commercial fraud since the adulterant is less sweet than the cane sugar, but there is no evidence to show that such sugar is unwholesome. Most syrups consist largely of

glucose, and the maple syrup commonly sold is not genuine, and, in the manufacture of confectionery, large quantities of glucose are used on account of its low price. Terra-alba (gypsum) is used to a considerable extent in cheap candies, and, while not poisonous, it is an insoluble earthy substance not desirable as a food. Certain poisonous colors are occasionally used by confectioners, and, as a rule, cheap and highly colored candies are to be viewed with suspicion. Most of the jellies, jams and preserves sold in the shops are sheer imitations, made from the cheapest, though not necessarily unwholesome, materials, and their use is not to be recommended.

Tea and coffee are articles that are frequently adulterated. Tea, so called, is often the merest rubbish, and many teas are "faced" with Prussian blue, indigo and other substances. Black teas are generally purer than green, and in purchasing, if a fair price is paid, a good article may generally be obtained. Unground coffee is seldom adul-

terated, but the coffee sold ground generally contains chicory (not unwholesome), and the cheapest varieties are sometimes made up of rye, beans, wheat, peas and the like, with more or less of chicory. Pure coffee (ground) floats upon water and imparts but little color to it, while chicory sinks and colors it rapidly. Spices are generally adulterated, but seldom with harmful substances. Many of the ground spices, as sold in the shops, are largely composed of peas, beans, ground cocoanut shells, stale ships' bread, etc. Mixtures of such substances are manufactured on a large scale and sold to dealers for use in the adulteration of spices. Mustard is universally mingled with flour and starch, and colored generally with turmeric, though sometimes with poisonous coloring matters. Vinegar is often of inferior strength from an undue addition of water, but is very rarely adulterated with mineral acids, as is commonly supposed. Olive oil is very largely adulterated with lard oil, cotton-seed oil, etc., but these

additions are harmless. Cream of tartar, as sold in the shops, is generally of very inferior quality, consisting in some cases of ninety per cent of gypsum. It ought to be purchased of reliable apothecaries.

The wines, malt liquors and ardent spirits that we drink are adulterated and falsified to a considerable extent, but not with the rank poisons that are considered by some to be their chief constituents. Many wines, like sherry, are artificial mixtures, though not necessarily made from deleterious substances. Much glucose is used in brewing beers and ales to save malt, and there is no real objection to this substitution, and other bitters than hops are occasionally, though rarely employed. Poisonous substances like *cocculus indicus* and *nux-vomica* are practically never used, though we hear much said about them. Distilled liquors are chiefly adulterated by dilution with water and colored with caramel. Much of the brandy, so called, is a mere imitation of the real article, but the common idea

that such liquors are manufactured from aqua fortis and oil of vitriol is a vulgar error. In the compounding of liquors, as in the preparation of other food articles, there is dilution, imitation and other deception, but positively harmful adulterations fortunately are the exception and not the rule.

We come now, and in conclusion, to speak briefly of water and the impurities which it may contain, and when we remember that many diseases are propagated by the use of defiled waters, and possibly, as regards a certain class of diseases, more frequently in this than any other way, we have no need to exaggerate the importance of the subject. Surface waters are generally less palatable than those from wells and springs, but unfortunately the color, odor and taste afford little indication of the real quality. Waters which have percolated through the soil are often bright and sparkling, but may, nevertheless, be loaded with impurities, and waters containing the germs of typhoid fever and other filth diseases may be to all ap-

pearances of very superior quality. As a rule, shallow wells in the vicinity of dwellings and out-houses are to be viewed with suspicion, since they may at any time become specifically contaminated, and capable of spreading infectious diseases. Especially is this true in thickly populated suburban districts where the wells are always in close proximity to privy-vaults and cesspools. Under such circumstances rain-water collected in clean cisterns, or preferably in tanks lined with slate or tinned and burnished copper, but never with lead, should be preferred. Filtration may improve the appearance of a water, but it by no means renders it safe to drink, and many filters are, in reality, worse than useless. In cases where it is necessary to use water of doubtful purity, it should always be boiled, and after cooling the clear water may be poured off from any sediment which has formed. Boiling probably destroys all disease germs, and if care is taken to employ only pure ice in cooling water which has been boiled, there is little risk in its use.

The complete analysis of potable waters is a laborious undertaking, and can only be performed by a competent chemist. Even then the results obtained are often unsatisfactory, and no analysis will enable us to say with certainty that a given water is absolutely pure on the one hand, or certain to produce disease on the other; but an analysis is capable of showing different degrees of purity, and if a water is certainly defiled with animal matter it ought not to be used for drinking, even though it may be used for a time without producing disease. The following superficial tests will aid us in forming an opinion as to the quality of a water: Add to some of the water in a clean glass a few drops of a solution of nitrate of silver (strength about twenty grains to an ounce of water), and a few drops of nitric acid; if a precipitate, or even a *decided* turbidity is produced, chlorides are present in considerable quantity, and may be due to sewage contamination. To a tablespoonful of the water in a wineglass add a drop or two of a solution made by dissolving

twelve grains of caustic potash and three grains of permanganate of potash in a fluid ounce of pure water; if the pink color speedily disappears the water may contain abnormal quantities of organic matter. Other things being equal the purer waters will keep the tint longest. Select a clean glass bottle, holding about a pint, and having filled it about two-thirds full of the water, add half a teaspoonful of pure granulated sugar, cork the bottle and allow it to stand in a warm place, and if, at the end of forty-eight hours, the contents of the bottle have become cloudy, milky or opalescent, the water is probably impure. Water which on standing for a time in a warm place exhales an unpleasant odor is likewise to be regarded with suspicion. Of course these tests are by no means infallible, and too much dependence must not be placed upon them, but they are as reliable as any simple tests can be, and if the results obtained by them are unfavorable, it will be best to abandon the supply, if practicable, or have a thorough analysis made. On the other hand,

should these tests fail to show impurity, while other evidences point to the water as a cause of disease, they should not be allowed to refute such evidence, since waters may be of a high degree of purity in a chemical sense, and yet contain matter which, though the chemist cannot recognize it, is capable of giving rise to disease. There is little doubt that cholera and typhoid fever are propagated more frequently by the use of drinking water to which the excreta of those suffering from these disorders have gained access, than in all other ways combined, and it behooves us, especially at times when these diseases are prevalent, or may become so, to look well to the quality of the water which we drink.

CHAPTER VI.

DISINFECTION.

Disinfection is the destroying of those micro-organisms, the development of which produces decomposition, disease or death. The substances by which such destruction is produced are called disinfectants. That the sanitary application of disinfection is not a matter of recent date, is shown by the fact that in 1771, during the pest in Moscow, Russian physicians, in order to determine the disinfecting power of sulphurous acid gas, took the garments in which the bodies of several persons dead of the pest had been wrapped, and, after subjecting them to the fumes of the gas for a definite time, caused a number of men condemned to death to put them on and wear them; it was

found that the peculiar power the garments formerly possessed of reproducing the pest had disappeared. Again in 1785 Berthollet made a bleaching powder called "Eau de Javelles," so named from the bleaching establishment where it was first made, and from that time to this the powder has been used as a disinfectant. Since 1809, when chlorine was recognized, this powder has been called by the more scientific, but much less euphonious, name of hypochlorite of potassa. It is within comparatively recent years, however, that disinfection has occupied the prominent position accorded to it at present. As the various aspects of the "germ theory" are developed, the special powers of various substances to modify the action of these microscopic germs are being investigated very thoroughly. The term disinfectant is very loosely used and very poorly comprehended by very many persons. Anything that will remove a bad odor is by them considered to be a disinfectant. It is important that this wrong impression should

be corrected, because much evil might ensue if only a deodorizer were used when a true disinfectant was called for. The market is full of patented compounds said, by their manufacturers, to be powerful disinfectants, when in truth they are nothing more than preparations that will remove bad smells—deodorizers. One step higher, if we take Dr. George M. Sternberg's division, we come to a class of substances which have the power to prevent putrefactive decomposition, but do not destroy the vitality of the disease germ; these are called antiseptics. Next we come to the true disinfectants, substances which kill the disease germs, thus rendering them incapable of propagation, no matter how favorable the circumstances under which the attempt is made. It will be at once perceived that it is upon the members of this latter class we place most reliance in time of epidemics, or during the prevalence of infectious disease, for at such times it is not enough that we arrest the growth of the disease germs; our object is to destroy

them. The committee of the American Public Health Association have made such careful investigations and performed such elaborate experiments to establish some facts which may be taken for a basis for operation, and the conclusions reached by them are so very generally considered correct that we quote very freely from them. The agents recommended as true disinfectants are, thus far, only three in number, viz.: corrosive sublimate, chlorinated soda, or its equivalent chloride of lime, and permanganate of potassa. The reader will at once enquire what is done with carbolic acid, copperas and like substances. Our answer is, the fiat has gone forth, they are only antiseptics. It must not be supposed that they are to be cast away and forgotten because they are no longer continued in the list of true disinfectants or germicides, not at all; but, as we have said, it is important to recognize distinctly the difference between the effects produced by members of the two classes. Take for example this illustration: If from time to time a solution of cop-

peras is thrown into a cesspool, putrefactive decomposition of the material in it is prevented, and it does not become offensive; if, however, the excreta from a typhoid fever or cholera patient gets into the cesspool, the germs of either disease will go on developing in spite of the copperas, and it becomes a source of infection; but they will in a very short time be killed if a sufficient quantity of any one of the substances named as disinfectants be thrown freely into the cesspool, and in a very short time the infecting material is destroyed. When we appreciate the rapidity with which some of these germs multiply, we see the necessity for their destruction. "It has been calculated by Ferdinand Cohn, that if the bacterium termo were unimpeded in its propagation, and if one were to multiply into two in the first hour, and these into four in the second hour, and these into eight in the third hour, and so on, the result would be 16,000,500 in the first day, and 281,000,000,000 on the second day, and that in five days time the progeny of this little micro

scopic body would fill the oceans of the world, so wonderfully numerous and fertile are they.” It will be seen that in such a case partial disinfection will not suffice, for if a single germ be left alive it will be multiplied indefinitely. Beside the three already mentioned, there are two others which deserve mention, and we may call them natural disinfectants; these are heat and fresh air.” The best of all disinfectants is fire. Burn up all dangerous things if you can. All rags and remnants of food that have been in contact with patients afflicted with scarlet fever, cholera or other infectious diseases should be thrown promptly into the fire. A large part of garbage that would soon putrify and become dangerous may be burned when there is no other ready means of its disposal. Every household, however poor, can command boiling water. Don’t lay aside towels, sheets, pillow-cases, pocket-handkerchiefs, night-gowns or other articles of the kind that have been in contact with the sick, to be washed at a convenient or leisure time, but boil them for an

hour or two at once. Articles that cannot be boiled without spoiling, may be safely and effectively baked at a temperature of 240° Fahrenheit.”*

In this connection Dr. Sternberg says of the relative value of dry and moist heat: “In dry air the heat penetrates objects so slowly that small packages, such as a pillow or small bundle of clothing, are not disinfected after an exposure of from two to three hours to a temperature of 140° C. (284° F.) Exposure to a temperature of 140° C. (284° F.) in dry air for a period of three hours injures most articles requiring disinfection (clothing, bedding, etc.) to a greater or less degree. In steam, however, at a temperature of from 105° to 110° C. (220° to 230° F.), we have an agent which quickly destroys all living organisms, including the most refractory spores. From the experimental evidence presented, it is safe to say that the temperature of boiling water will quickly destroy the vitality of all micro-organisms of the

* Health Maxims—Dr. O. W. Wright.

class to which all known disease germs belong, in the absence of spores. Steam, at the temperature of 105° C. (220° F.) maintained for one or two minutes, or of 110° C. (230° F.) maintained for ten minutes, will infallibly destroy the spores of bacilli, which constitute the most difficult test of disinfecting power known.”*

Next in general value is fresh air—plenty of it, in constant currents. Sunlight should be abundantly mixed with it as an adjuvant. The oxygen of pure air kindles a slow fire in all filth with which it comes in contact. Ozone, sometimes abounding in the atmosphere, is still more potent. Let it freely into houses, cellars, and especially sick rooms. Chloride of lime is one of the best, and, when mixed with hydrochloric acid, produces a gas fatal to every form of germ life. If to chloride of lime an equal amount of hydrochloric acid be added, there will be produced a gas which, by penetrating every crevice and corner, will reach

* Medical News, Mar. 14, 1885.

what nothing else can. It will be necessary to place the dish containing the disinfectant high up in the room, because of the density of the gas. It must be remembered that this gas has the power to destroy metallic surfaces, also to remove color from textile fabrics, and cannot be inhaled at all. All articles liable to injury should, when possible, be removed from the room. Metallic surfaces may be protected by oil or varnish placed upon them. After the room has been closed for twelve hours, subjected to the action of this gas, cloths saturated with ammonia may be introduced for the purpose of neutralizing what gas may be present. The windows should be opened and the air allowed to circulate freely through the room for twenty-four hours. The chloride of lime itself may be used either in solution or powder, but should be kept in tightly corked bottles. For privies and cesspools one pound of the powder should be used for every thirty pounds of matter. The clothing of the patient sick with cholera, all linen used in the sick-

room, before its removal from the room, should be saturated with some disinfecting solution; but the solution of chloride of lime is not so well adapted to this purpose as is that of the bichloride of mercury. Of even more importance than the disinfecting of the clothing and linen is the disinfection of the dejecta of the patient. For this purpose the solution of which we are now speaking, on account of the rapidity of its action, is most valuable. The following standard solution is recommended: "Dissolve chloride of lime of the best quality in soft water, in the proportion of four ounces to the gallon. Use one pint of this solution for the disinfection of each discharge in cholera, typhoid fever, etc. Mix well and leave for at least ten minutes before throwing into the privy vault or water closet. The same directions apply for the disinfection of vomited matter. For cesspools and privy vaults use one gallon of solution to every gallon of matter. Infected sputum should be discharged directly into a cup half-full of the solution."*

* Medical News, April 18, 1885.

infectant somewhat more expensive, and with perhaps no special advantages, is that called Labarraque's solution, but the article sold under that name is oftentimes of very inferior quality. For those who prefer to use this preparation rather than that of chloride of lime, the following formula will furnish a good article: Take of chloride of lime eighty parts and put it into four hundred parts of water, keeping in a tightly covered vessel; take of carbonate of sodium one hundred and twenty parts and mix with four hundred parts of boiling water; when cool, mix the two solutions and add water sufficient to make a thousand parts; keep tightly corked. Of this, for use, take one part and to it add five parts of soft water; it may be used the same as chloride of lime. There is an objection to both of these solutions from the fact that they have an unpleasant odor, that of chlorine. To offset this they have a value from the fact that they decompose, in place of coagulating, as does the bichloride of mercury, albuminoid substances,

and when such substances appear in the discharges of the patient, or in any other way, for disinfection these disinfectants should be used in preference to the bichloride of mercury (corrosive sublimate). This latter, while a powerful and valuable disinfectant, is very poisonous, and the free use of it in the family should be attended with extreme caution. As a means for disinfecting the clothing and linen of the sick-room, as we have already said, it is of great value. Where, also, for any reason whatever, it is impossible to use chlorine gas for the purpose of disinfecting the room after the removal of the patient, this will be found a valuable solution with which to wash the wood-work, floors, cornices and furniture. Indeed, it is advisable to have the rooms thus washed, even after fumigation has been resorted to. The solution of bichloride of mercury may be made by taking equal parts of it and common salt and dissolving them in water, the salt in this case acts as a solvent; an ounce of this powder

may be used to eight gallons of water. It must be remembered that this solution becomes decomposed and the mercury precipitated by coming in contact with copper, lead or tin. A wooden tub or earthen crock is a suitable receptacle for such a solution. As this substance is poisonous, but at the same time odorless and perfectly clear, it might possibly be mistaken for clear water. To prevent the possibility of this, Dr. Sternberg has suggested that there be mixed with it a small portion of permanganate of potassa. This imparts to the solution a beautiful and very distinctive color, and no fluid containing it would be mistaken for a potable liquid. His formula is: "Dissolve corrosive sublimate in water in the proportion of four ounces to the gallon, and add one drachm of permanganate of potassa to each gallon to give color to the solution. One fluid ounce of this solution," he says, "to the gallon of water will be a suitable solution for the disinfection of clothing. The articles to be disinfected must be thoroughly soaked with

the disinfecting solution and left in it at least two hours, after which they may be wrung out and sent to the wash." *

One gallon of this solution, diluted with three gallons of water, may be used in privies and cesspools in the proportion of one gallon to every four gallons of matter, or the powder may be used in the proportion of one pound to every five hundred pounds of matter. Permanganate of potassa has very decided germicidal and antiseptic properties, and as a deodorizer it is rapid and complete in its action, but it is not generally applicable as a disinfectant, because of the rapidity with which it is decomposed by organic matter. Mixed with a solution of bichloride of mercury, it serves the double purpose of increasing the disinfecting power of the solution, while, at the same time, it throws a safeguard around its use.

We have briefly called attention to the best disinfectants; because mention has not been made of others, nor stress laid upon some

* Medical News, April 18, 1885.

substances commonly called disinfectants, but, by the division adopted in this book, properly called antiseptics, it must not be thought their value is ignored. They should be used at all times when necessary to keep the atmosphere sweet and clean, but when infectious diseases are present, it is not safe to use any thing that is not a germicide as well as an antiseptic.

In conclusion, the prompt and faithful discharge of sanitary duties by officials and individuals is a most essential factor in the prevention of cholera, and the maintenance of such hygienic and sanitary conditions as best promote the public health, will make the dread disease a matter of history only.

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